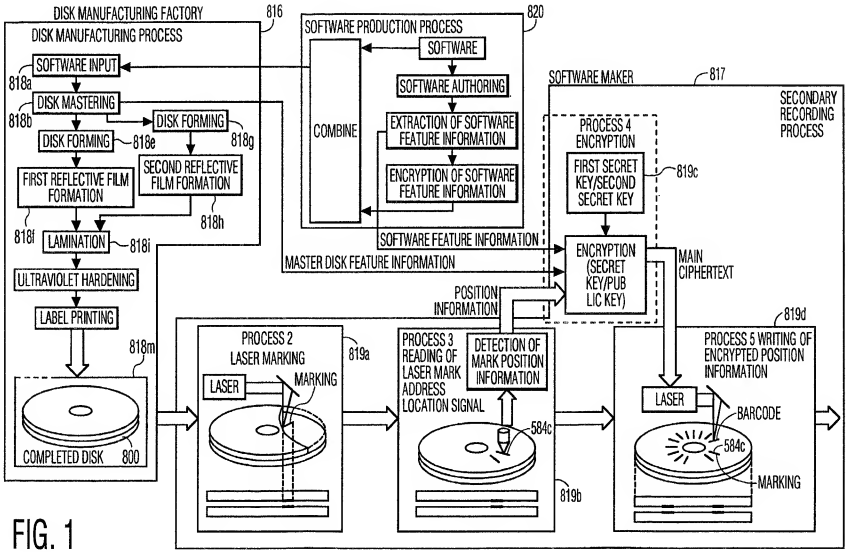

DISK MANUFACTURING FACTORY
816
DISK MANUFACTURING PROCESS
SOFTWARE INPUT
818a
DISK MASTERING
818b
DISK FORMING
818e
DISK FORMING
818g
FIRST REFLECTIVE FILM FORMATION
SECOND REFLECTIVE FILM FORMATION
818f
818h
LAMINATION
818i
ULTRAVIOLET HARDENING
LABEL PRINTING
818m
COMPLETED DISK
800
SOFTWARE PRODUCTION PROCESS
820
SOFTWARE
SOFTWARE AUTHORING
COMBINE
EXTRACTION OF SOFTWARE FEATURE INFORMATION
ENCRYPTION OF SOFTWARE FEATURE INFORMATION
SOFTWARE FEATURE INFORMATION
MASTER DISK FEATURE INFORMATION
SOFTWARE MAKER
817
SECONDARY RECORDING PROCESS
PROCESS 4 ENCRYPTION
FIRST SECRET KEY/SECOND SECRET KEY
819c
ENCRYPTION (SECRET KEY/PUB LIC KEY)
MAIN CIPHERTEXT
POSITION INFORMATION
819d
PROCESS 2 LASER MARKING
819a
LASER
MARKING
PROCESS 3 READING OF LASER MARK ADDRESS LOCATION SIGNAL
DETECTION OF MARK POSITION INFORMATION
584c
819b
PROCESS 5 WRITING OF ENCRYPTED POSITION INFORMATION
LASER
BARCODE
584c
MARKING

FIG. 1

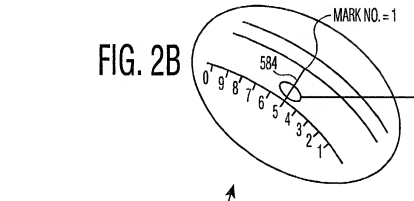


FIG. 2B

FIG. 2C

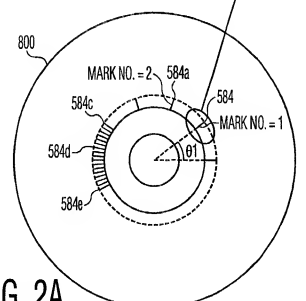


FIG. 2A

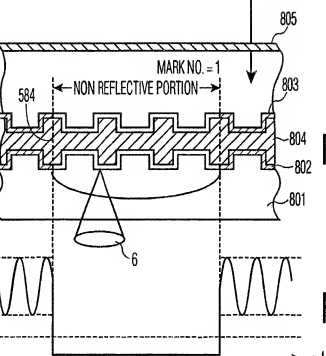


FIG. 2D

FIG. 2E

Printed: 10/29/2001

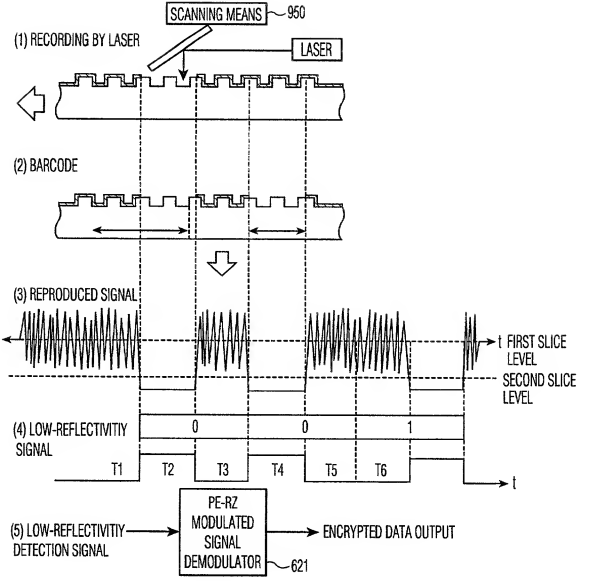


FIG. 3

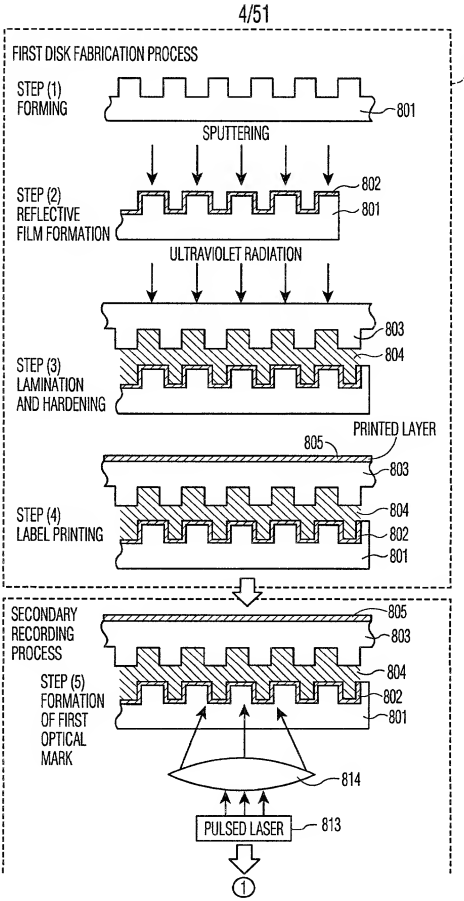


FIG. 4

Machine Translated by Google

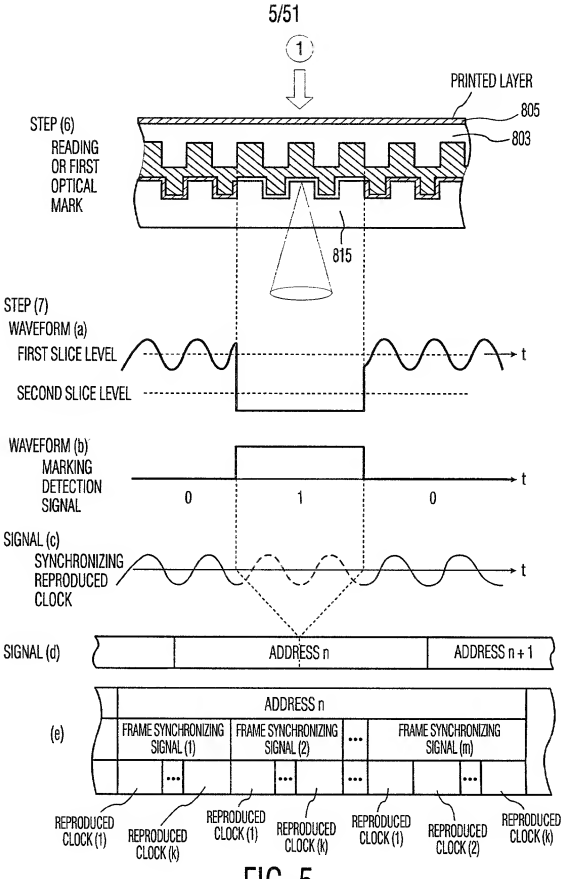


FIG. 5

1005901 "02012

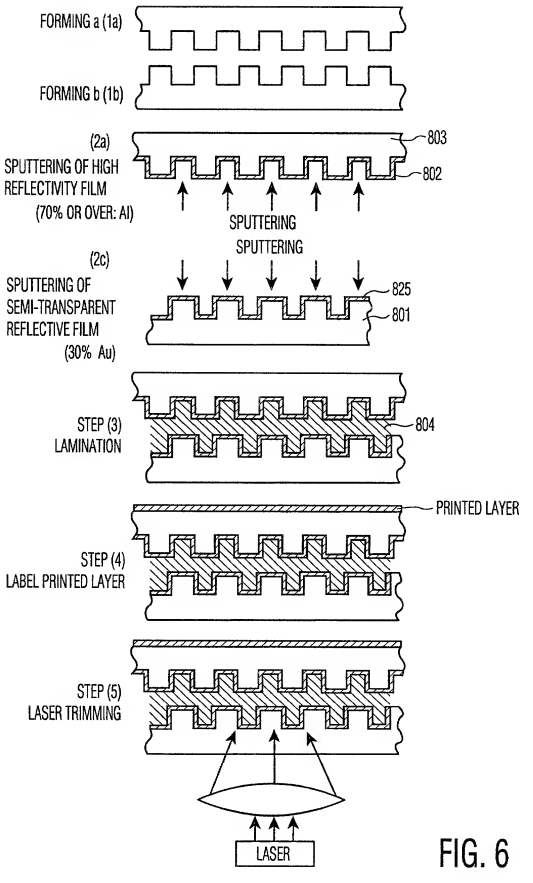


FIG. 6

Scanned from 20060525

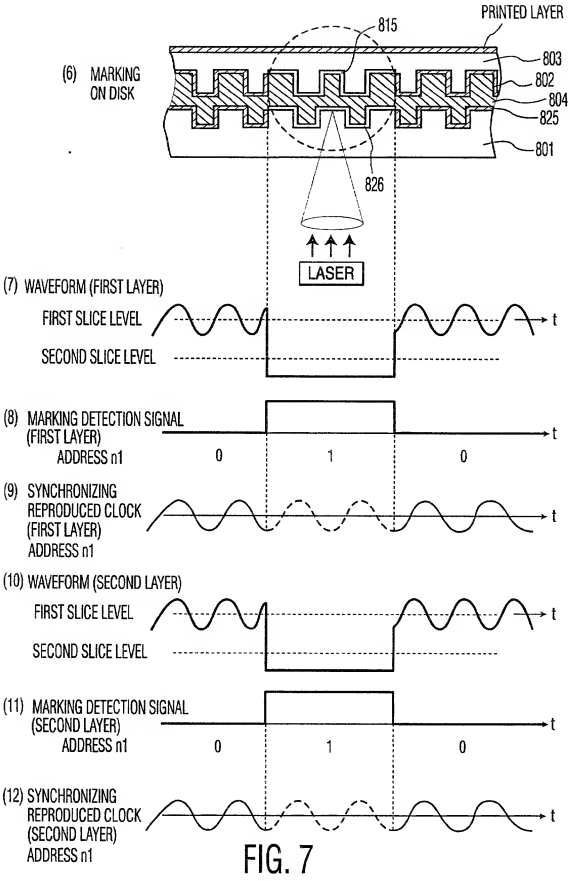

PRINTED LAYER
815
803
802
804
825
801
826
(6) MARKING ON DISK
LASER
(7) WAVEFORM (FIRST LAYER)
FIRST SLICE LEVEL
SECOND SLICE LEVEL
t
(8) MARKING DETECTION SIGNAL (FIRST LAYER)
ADDRESS n1
0
1
0
(9) SYNCHRONIZING REPRODUCED CLOCK (FIRST LAYER)
ADDRESS n1
(10) WAVEFORM (SECOND LAYER)
FIRST SLICE LEVEL
SECOND SLICE LEVEL
(11) MARKING DETECTION SIGNAL (SECOND LAYER)
ADDRESS n1
(12) SYNCHRONIZING REPRODUCED CLOCK (SECOND LAYER)
ADDRESS n1

FIG. 7

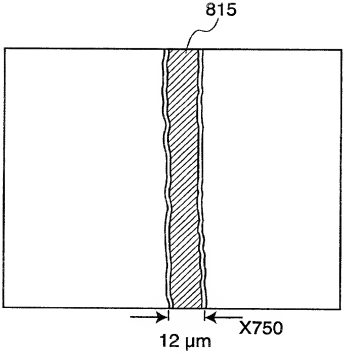


FIG. 8A

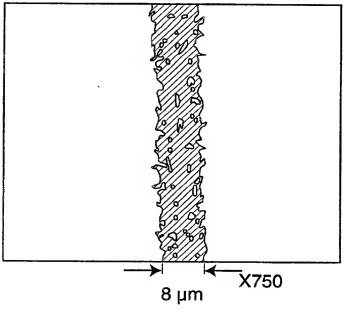


FIG. 8B

Copied: 10/05/05

FIG. 9A

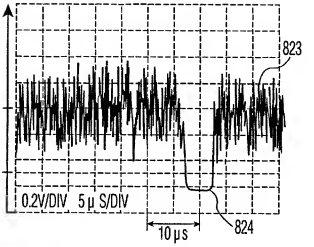


FIG. 9B

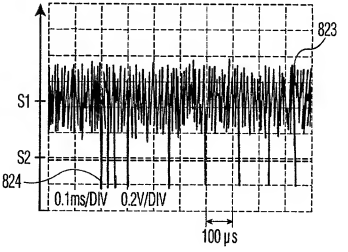


FIG. 9C

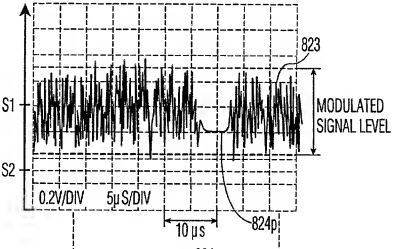


FIG. 9D

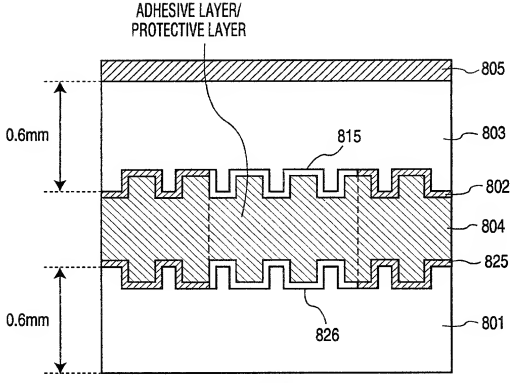


FIG. 10A

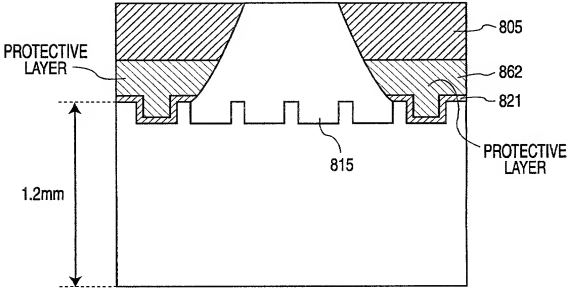


FIG. 10B

ENTERED: TOSHIBA

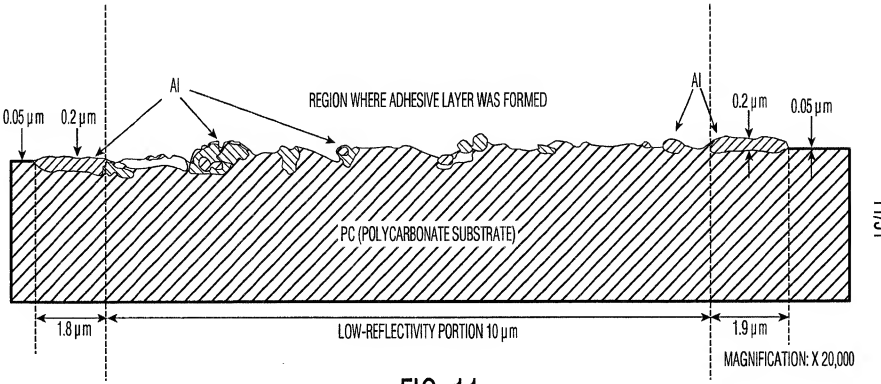

0.05 μm
0.2 μm
Al
REGION WHERE ADHESIVE LAYER WAS FORMED
Al
0.2 μm
0.05 μm
PC (POLYCARBONATE SUBSTRATE)
1.8 μm
LOW-REFLECTIVITY PORTION 10 μm
1.9 μm
MAGNIFICATION: X 20,000

FIG. 11

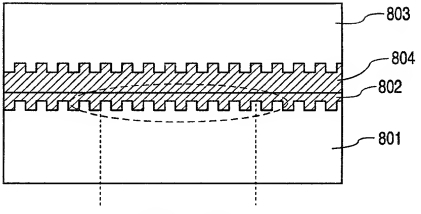


FIG. 12A

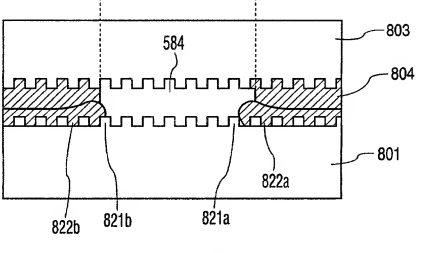


FIG. 12B

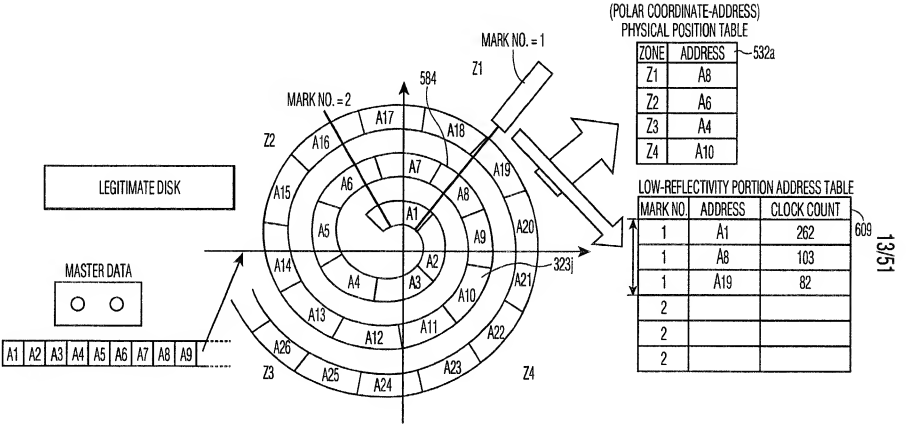

(POLAR COORDINATE-ADDRESS) PHYSICAL POSITION TABLE
ZONE | ADDRESS
Z1 | A8
Z2 | A6
Z3 | A4
Z4 | A10
532a
LOW-REFLECTIVITY PORTION ADDRESS TABLE
MARK NO. | ADDRESS | CLOCK COUNT
1 | A1 | 262
1 | A8 | 103
1 | A19 | 82
2
2
2
609
MARK NO. = 1
MARK NO. = 2
584
323j
LEGITIMATE DISK
MASTER DATA
A1 A2 A3 A4 A5 A6 A7 A8 A9
Z1
Z2
Z3
Z4
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A25 A26

FIG. 13A

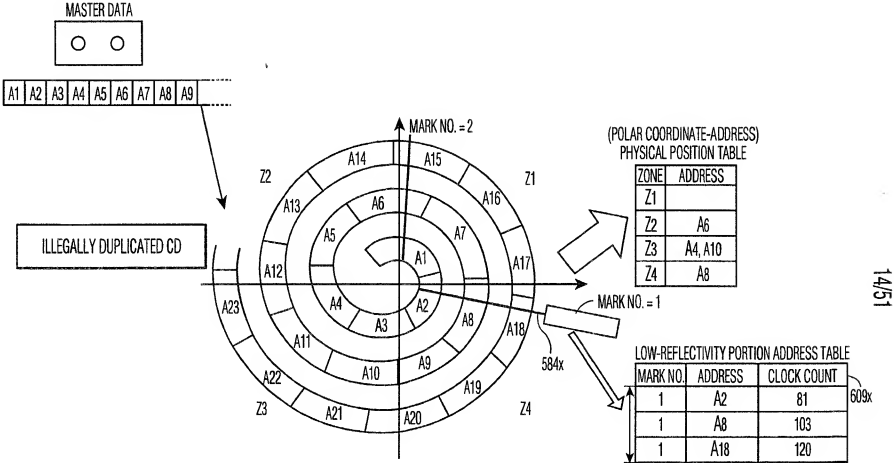

MASTER DATA
A1 A2 A3 A4 A5 A6 A7 A8 A9
ILLEGALLY DUPLICATED CD
MARK NO. = 2
MARK NO. = 1
Z1
Z2
Z3
Z4
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23
584x
609x
(POLAR COORDINATE-ADDRESS) PHYSICAL POSITION TABLE
ZONE | ADDRESS
Z1 |
Z2 | A6
Z3 | A4, A10
Z4 | A8
LOW-REFLECTIVITY PORTION ADDRESS TABLE
MARK NO. | ADDRESS | CLOCK COUNT
1 | A2 | 81
1 | A8 | 103
1 | A18 | 120
2 |
2 |
2 |

FIG. 13B

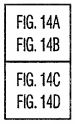


FIG. 14

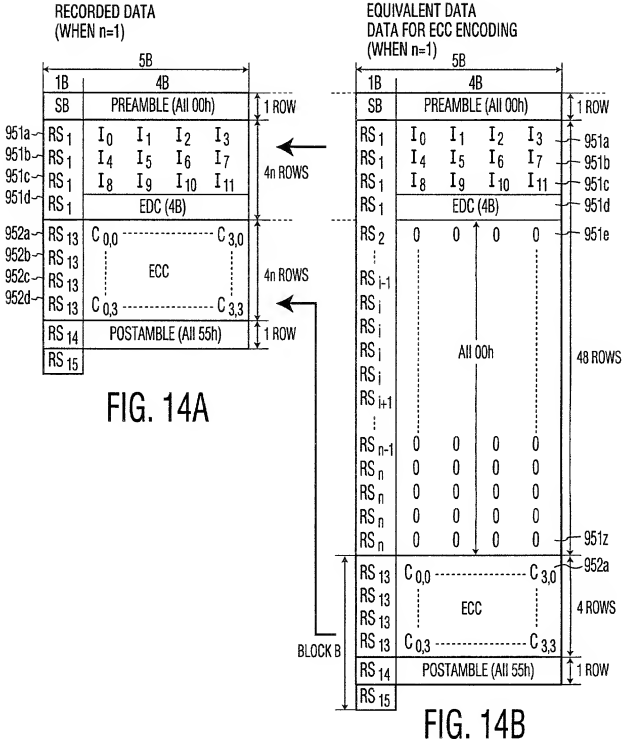


FIG. 14A

FIG. 14B

2004020-1055004

TYPICAL EQUATION
FOR EDC COMPUTATION
EDC (ERROR DETECTION CODE) :

$$EDC_{PCA}(x) = \sum_{i=0}^{31} bi \cdot x^i$$

$$I_{PCA}(x) = \sum_{i=32}^{128n-31} bi \cdot x^i$$

FIG. 14C

TYPICAL EQUATION
FOR EDC COMPUTATION
ECC (ERROR CORRECTION CODE) :

$$R_{PCA}(x) = \sum_{i=48}^{51} I_{j+4i} \cdot x^{51-i}$$

$$I_{PCA}(x) = \sum_{i=0}^{4n-2} I_{j+4i} \cdot x^{51-i} + D_j \cdot x^{52-4n},$$

FIG. 14D

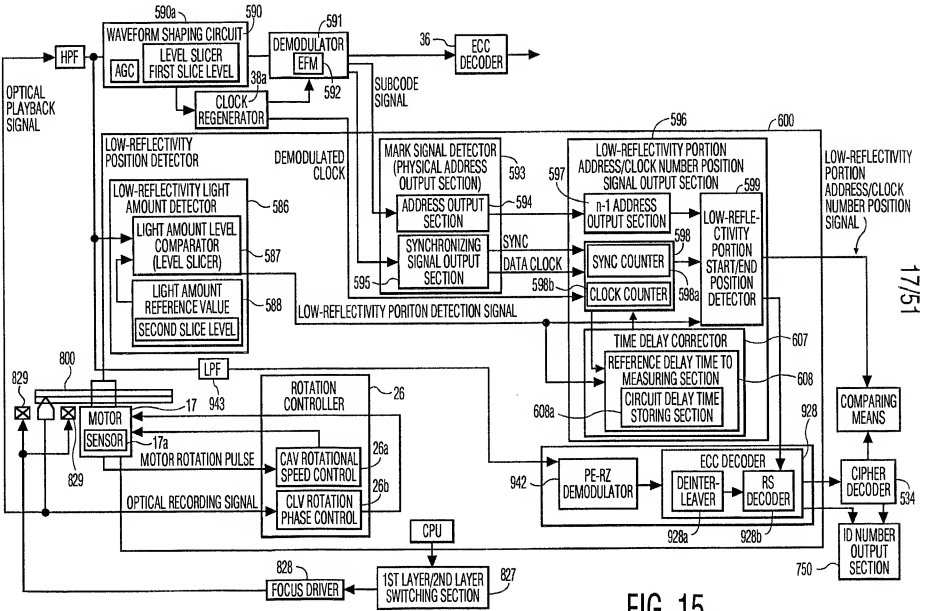

590a
590
591
WAVEFORM SHAPING CIRCUIT
AGC
LEVEL SLICER FIRST SLICE LEVEL
DEMODULATOR
EFM
592
38a
36
ECC DECODER
HPF
OPTICAL PLAYBACK SIGNAL
CLOCK REGENERATOR
SUBCODE SIGNAL
596
600
LOW-REFLECTIVITY POSITION DETECTOR
DEMODULATED CLOCK
MARK SIGNAL DETECTOR (PHYSICAL ADDRESS OUTPUT SECTION)
593
LOW-REFLECTIVITY PORTION ADDRESS/CLOCK NUMBER POSITION SIGNAL OUTPUT SECTION
597
599
LOW-REFLECTIVITY PORTION ADDRESS/CLOCK NUMBER POSITION SIGNAL
LOW-REFLECTIVITY LIGHT AMOUNT DETECTOR
586
ADDRESS OUTPUT SECTION
594
n-1 ADDRESS OUTPUT SECTION
LOW-REFLECTIVITY PORTION START/END POSITION DETECTOR
LIGHT AMOUNT LEVEL COMPARATOR (LEVEL SLICER)
587
SYNCHRONIZING SIGNAL OUTPUT SECTION
595
SYNC
DATA CLOCK
598
SYNC COUNTER
598b
CLOCK COUNTER
598a
LIGHT AMOUNT REFERENCE VALUE
588
SECOND SLICE LEVEL
LOW-REFLECTIVITY PORITON DETECTION SIGNAL
TIME DELAY CORRECTOR
607
REFERENCE DELAY TIME TO MEASURING SECTION
608
CIRCUIT DELAY TIME STORING SECTION
608a
800
829
LPF
943
ROTATION CONTROLLER
26
17
MOTOR
SENSOR
17a
MOTOR ROTATION PULSE
CAV ROTATIONAL SPEED CONTROL
26a
OPTICAL RECORDING SIGNAL
CLV ROTATION PHASE CONTROL
26b
829
928
COMPARING MEANS
ECC DECODER
942
PE-RZ DEMODULATOR
DEINTER-LEAVER
RS DECODER
CIPHER DECODER
534
928a
928b
CPU
ID NUMBER OUTPUT SECTION
750
828
FOCUS DRIVER
1ST LAYER/2ND LAYER SWITCHING SECTION
827

FIG. 15

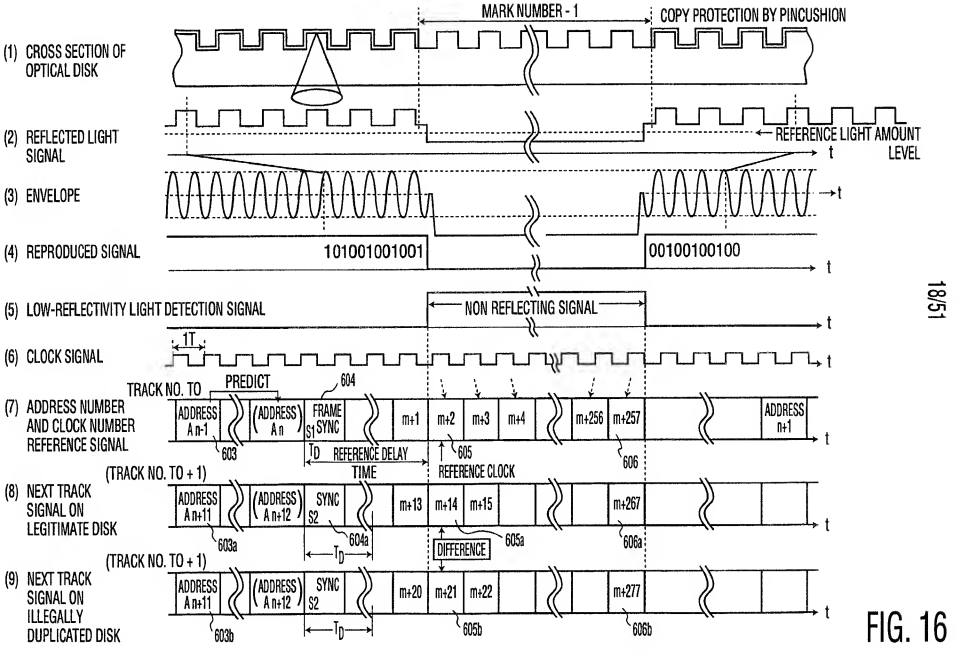

MARK NUMBER - 1
COPY PROTECTION BY PINCUSHION
(1) CROSS SECTION OF OPTICAL DISK
(2) REFLECTED LIGHT SIGNAL
REFERENCE LIGHT AMOUNT LEVEL
(3) ENVELOPE
(4) REPRODUCED SIGNAL
101001001001
00100100100
(5) LOW-REFLECTIVITY LIGHT DETECTION SIGNAL
NON REFLECTING SIGNAL
(6) CLOCK SIGNAL
1T
TRACK NO. TO
PREDICT
604
(7) ADDRESS NUMBER AND CLOCK NUMBER REFERENCE SIGNAL
ADDRESS An-1
ADDRESS An
FRAME SYNC
S1
m+1
m+2
m+3
m+4
m+256
m+257
ADDRESS n+1
603
TD REFERENCE DELAY TIME
605
REFERENCE CLOCK
606
(TRACK NO. TO + 1)
(8) NEXT TRACK SIGNAL ON LEGITIMATE DISK
ADDRESS An+11
ADDRESS An+12
SYNC
S2
m+13
m+14
m+15
m+267
603a
604a
TD
605a
DIFFERENCE
606a
(TRACK NO. TO + 1)
(9) NEXT TRACK SIGNAL ON ILLEGALLY DUPLICATED DISK
ADDRESS An+11
ADDRESS An+12
SYNC
S2
m+20
m+21
m+22
m+277
603b
TD
605b
606b
t

FIG. 16

LEGITIMATE DISK

LOW-REFLECTIVITY PORTION ADDRESS TABLE

MARK NO.	START POSITION			END POSITION		
	ADDRESS	SYNC NO	CLOCK NUMBER	ADDRESS	SYNC NO	CLOCK NUMBER
1	A n	S1	m+2	n		m+257
1	A n+12	S2	m+14	n+12		m+267
1	A n+23		m+25	n+23		m+300
:	:		:	:		:
2	A n+1		m+15	n+1		m+160
2	A n+13		m+85	n+13		m+250
2	A n+24		m+68	n+24		m+210
0	A n+9					
0						

609

PLANNING

ILLEGALLY DUPLICATED DISK

LOW-REFLECTIVITY PORTION ADDRESS TABLE

MARK NO.	START POSITION			END POSITION		
	ADDRESS	SYNC NO	CLOCK NUMBER	ADDRESS	SYNC NO	CLOCK NUMBER
1	n	S1	m+2	n		m+257
1	n+12	S2	m+21	n+12		m+277
1	n+22		m+4	n+22		m+230
:	:		:	:		:
2	n+1		m+36	n+1		m+190
2	n+13		m+120	n+13		m+281
2	n+25			n+25		
0	n+9					
0						

FIG. 17

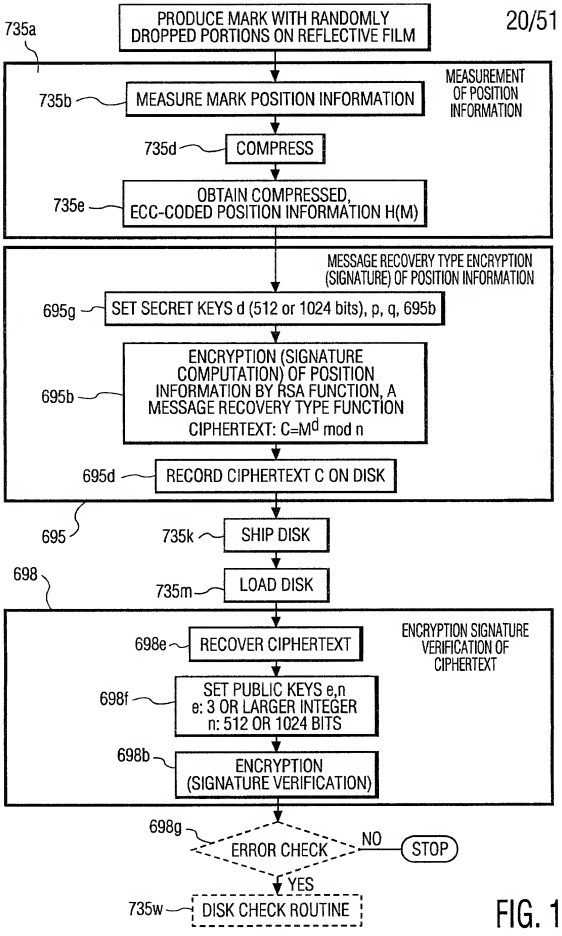


FIG. 18A

Digitized by Google

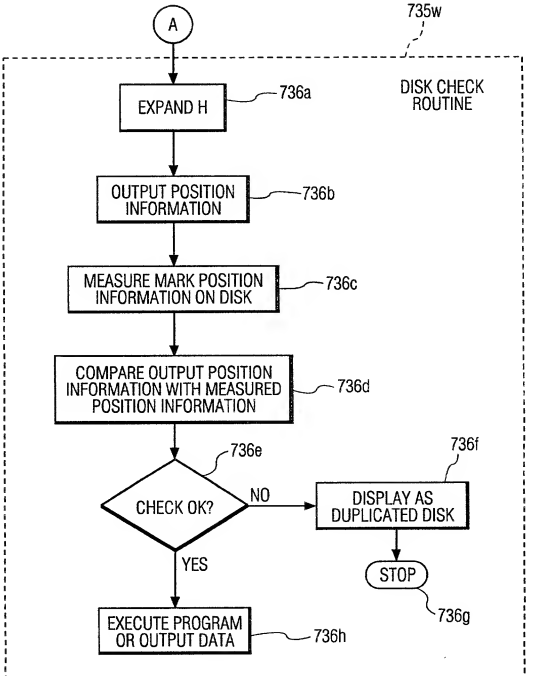


FIG. 18B

ASSIGNED TO SONY

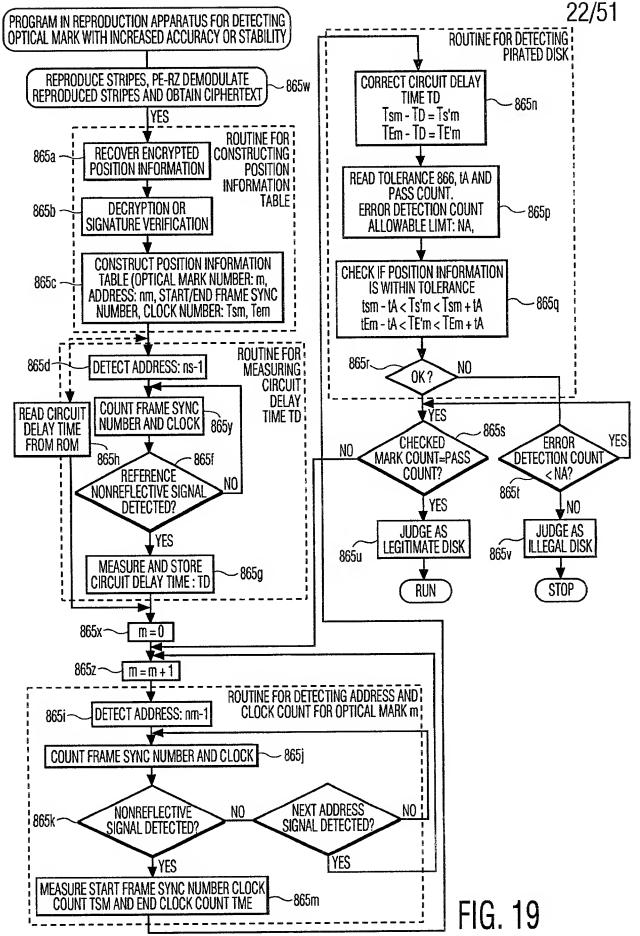

PROGRAM IN REPRODUCTION APPARATUS FOR DETECTING OPTICAL MARK WITH INCREASED ACCURACY OR STABILITY
REPRODUCE STRIPES, PE-RZ DEMODULATE REPRODUCED STRIPES AND OBTAIN CIPHERTEXT
865w
YES
ROUTINE FOR CONSTRUCTING POSITION INFORMATION TABLE
865a
RECOVER ENCRYPTED POSITION INFORMATION
865b
DECRYPTION OR SIGNATURE VERIFICATION
865c
CONSTRUCT POSITION INFORMATION TABLE (OPTICAL MARK NUMBER: m, ADDRESS: nm, START/END FRAME SYNC NUMBER, CLOCK NUMBER: Tsm, Tem
ROUTINE FOR MEASURING CIRCUIT DELAY TIME TD
865d
DETECT ADDRESS: ns-1
READ CIRCUIT DELAY TIME FROM ROM
865n
COUNT FRAME SYNC NUMBER AND CLOCK
865y
865f
REFERENCE NONREFLECTIVE SIGNAL DETECTED?
NO
YES
MEASURE AND STORE CIRCUIT DELAY TIME : TD
865g
865x
m = 0
865z
m = m + 1
ROUTINE FOR DETECTING ADDRESS AND CLOCK COUNT FOR OPTICAL MARK m
865i
DETECT ADDRESS: nm-1
COUNT FRAME SYNC NUMBER AND CLOCK
865j
865k
NONREFLECTIVE SIGNAL DETECTED?
NO
NEXT ADDRESS SIGNAL DETECTED?
NO
YES
YES
MEASURE START FRAME SYNC NUMBER CLOCK COUNT TSM AND END CLOCK COUNT TME
865m
ROUTINE FOR DETECTING PIRATED DISK
CORRECT CIRCUIT DELAY TIME TD
Tsm - TD = Ts'm
TEm - TD = TE'm
865n
READ TOLERANCE 866, tA AND PASS COUNT, ERROR DETECTION COUNT ALLOWABLE LIMT: NA,
865p
CHECK IF POSITION INFORMATION IS WITHIN TOLERANCE
tsm - tA < Ts'm < Tsm + tA
tEm - tA < TE'm < TEm + tA
865q
865r
OK?
NO
YES
865s
CHECKED MARK COUNT=PASS COUNT?
NO
YES
ERROR DETECTION COUNT < NA?
YES
NO
865t
865u
JUDGE AS LEGITIMATE DISK
865v
JUDGE AS ILLEGAL DISK
RUN
STOP

FIG. 19

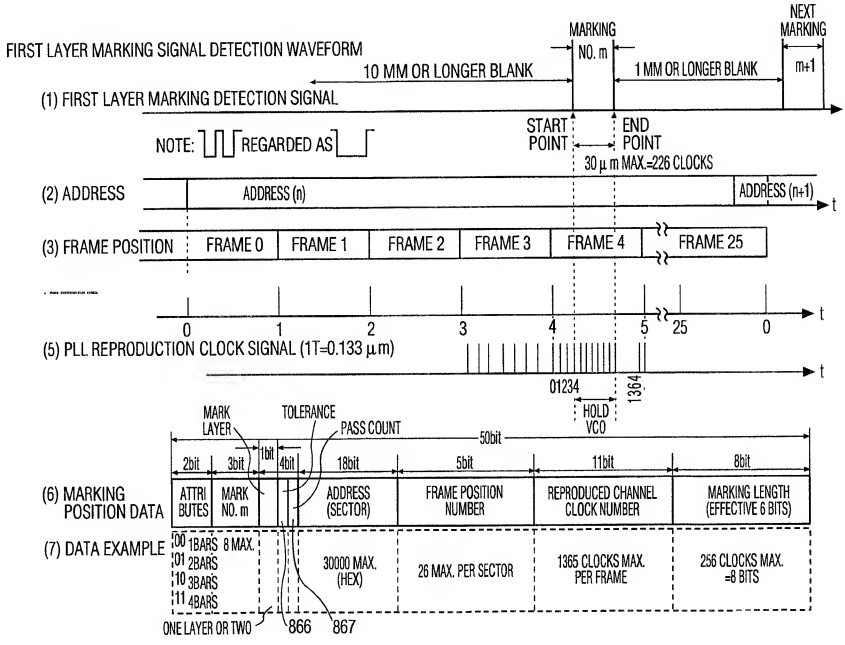

FIRST LAYER MARKING SIGNAL DETECTION WAVEFORM
MARKING NO. m
NEXT MARKING m+1
10 MM OR LONGER BLANK
1 MM OR LONGER BLANK
(1) FIRST LAYER MARKING DETECTION SIGNAL
t
NOTE: REGARDED AS
START POINT
END POINT
30 μm MAX.=226 CLOCKS
(2) ADDRESS
ADDRESS (n)
ADDRESS (n+1)
(3) FRAME POSITION
FRAME 0
FRAME 1
FRAME 2
FRAME 3
FRAME 4
FRAME 25
0 1 2 3 4 5 25 0
(5) PLL REPRODUCTION CLOCK SIGNAL (1T=0.133 μm)
01234
1364
HOLD
VCO
MARK LAYER
TOLERANCE
PASS COUNT
50bit
2bit 3bit 1bit 4bit 18bit 5bit 11bit 8bit
(6) MARKING POSITION DATA
ATTRIBUTES
MARK NO. m
ADDRESS (SECTOR)
FRAME POSITION NUMBER
REPRODUCED CHANNEL CLOCK NUMBER
MARKING LENGTH (EFFECTIVE 6 BITS)
(7) DATA EXAMPLE
00 1BARS 8 MAX.
01 2BARS
10 3BARS
11 4BARS
30000 MAX. (HEX)
26 MAX. PER SECTOR
1365 CLOCKS MAX. PER FRAME
256 CLOCKS MAX. =8 BITS
ONE LAYER OR TWO
866
867

FIG. 20

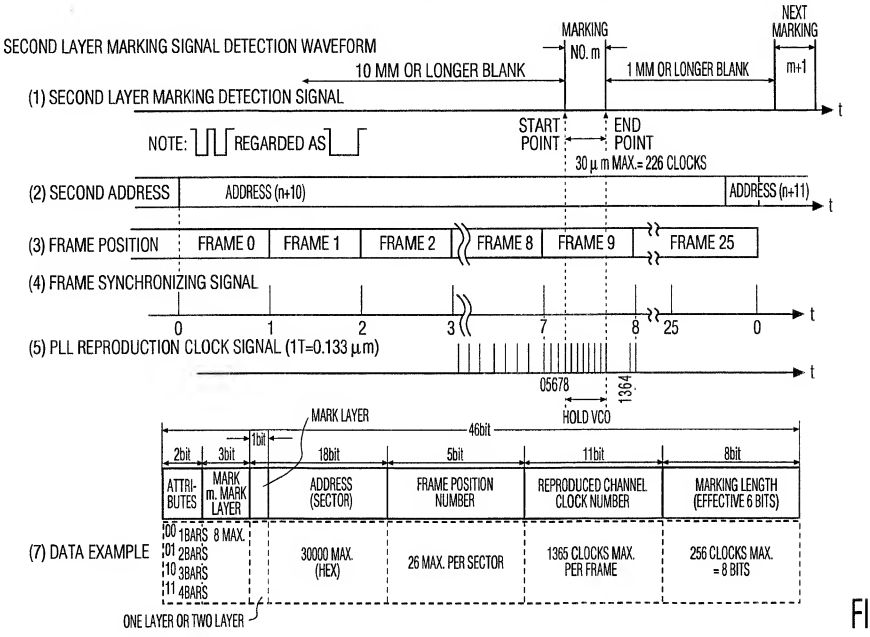

SECOND LAYER MARKING SIGNAL DETECTION WAVEFORM
MARKING NO. m
NEXT MARKING m+1
10 MM OR LONGER BLANK
1 MM OR LONGER BLANK
(1) SECOND LAYER MARKING DETECTION SIGNAL
t
NOTE: REGARDED AS
START POINT
END POINT
30 μm MAX.= 226 CLOCKS
(2) SECOND ADDRESS
ADDRESS (n+10)
ADDRESS (n+11)
(3) FRAME POSITION
FRAME 0
FRAME 1
FRAME 2
FRAME 8
FRAME 9
FRAME 25
(4) FRAME SYNCHRONIZING SIGNAL
0
1
2
3
7
8
25
0
(5) PLL REPRODUCTION CLOCK SIGNAL (1T=0.133 μm)
05678
1364
HOLD VCO
MARK LAYER
46bit
1bit
2bit
3bit
18bit
5bit
11bit
8bit
ATTRI-BUTES
MARK m. MARK LAYER
ADDRESS (SECTOR)
FRAME POSITION NUMBER
REPRODUCED CHANNEL CLOCK NUMBER
MARKING LENGTH (EFFECTIVE 6 BITS)
(7) DATA EXAMPLE
00 1BARS 8 MAX.
01 2BARS
10 3BARS
11 4BARS
30000 MAX. (HEX)
26 MAX. PER SECTOR
1365 CLOCKS MAX. PER FRAME
256 CLOCKS MAX. = 8 BITS
ONE LAYER OR TWO LAYER

FIG. 21

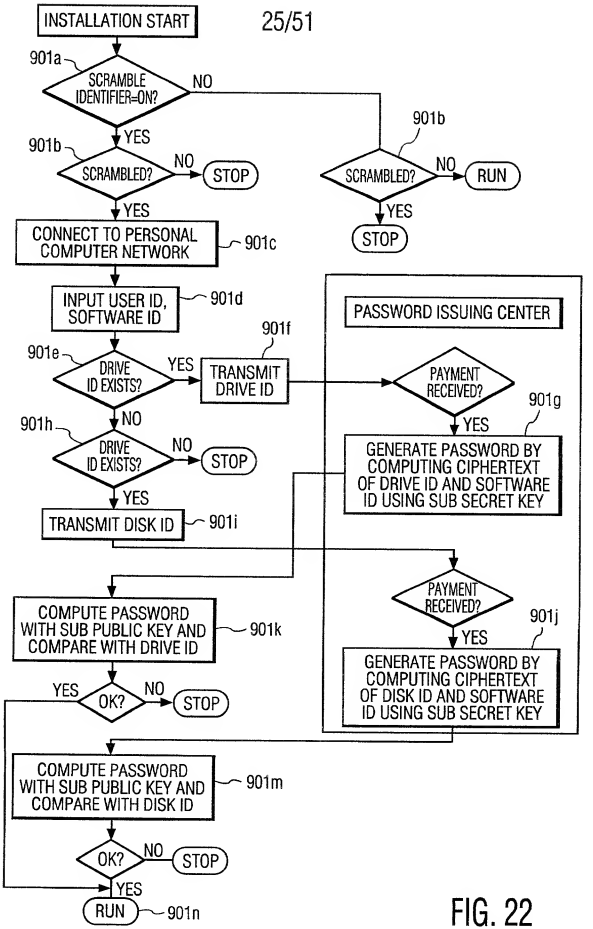


FIG. 22

Entered: 10/23/2001

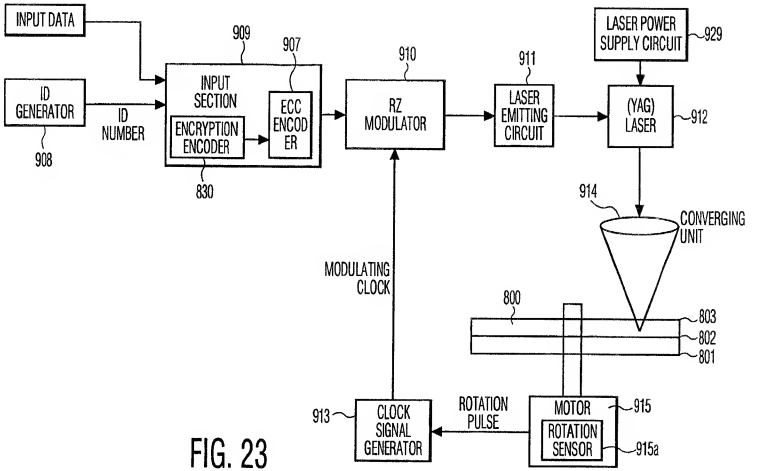

INPUT DATA
ID GENERATOR
908
ID NUMBER
909
907
INPUT SECTION
ENCRYPTION ENCODER
ECC ENCODER
830
910
RZ MODULATOR
911
LASER EMITTING CIRCUIT
LASER POWER SUPPLY CIRCUIT
929
(YAG) LASER
912
914
CONVERGING UNIT
MODULATING CLOCK
800
803
802
801
913
CLOCK SIGNAL GENERATOR
ROTATION PULSE
MOTOR
915
ROTATION SENSOR
915a

FIG. 23

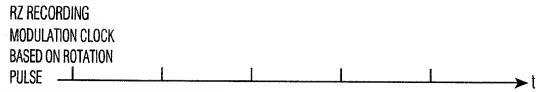


FIG. 24A (1) RECORDED SIGNAL OF "00"

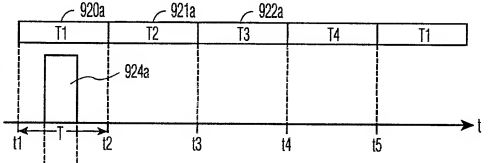


FIG. 24B

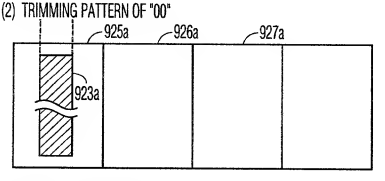


FIG. 24C

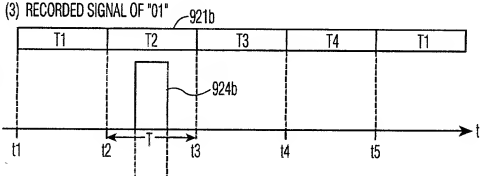


FIG. 24D

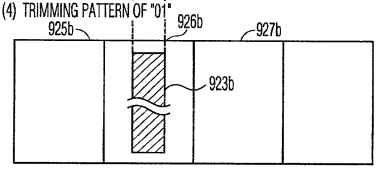


FIG. 24E

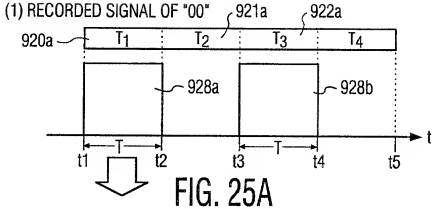


FIG. 25A

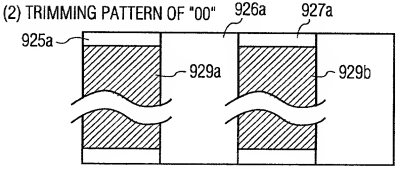


FIG. 25B

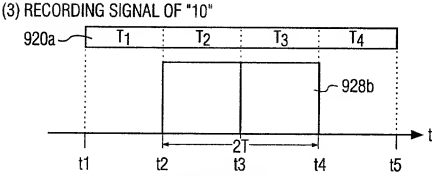


FIG. 25C

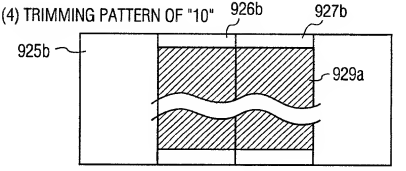


FIG. 25D

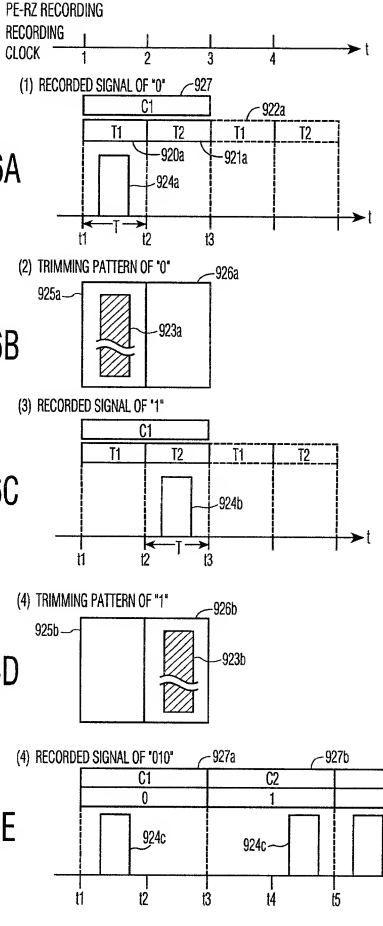


FIG. 26A

FIG. 26B

FIG. 26C

FIG. 26D

FIG. 26E

(1) TOP PLAN VIEW

FIG. 27A

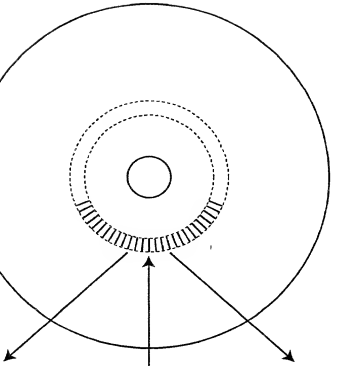
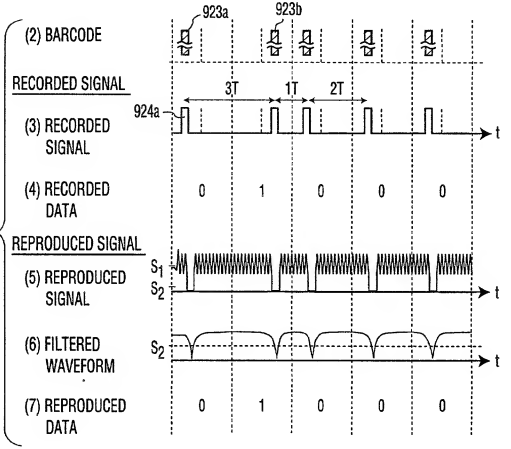


FIG. 27B



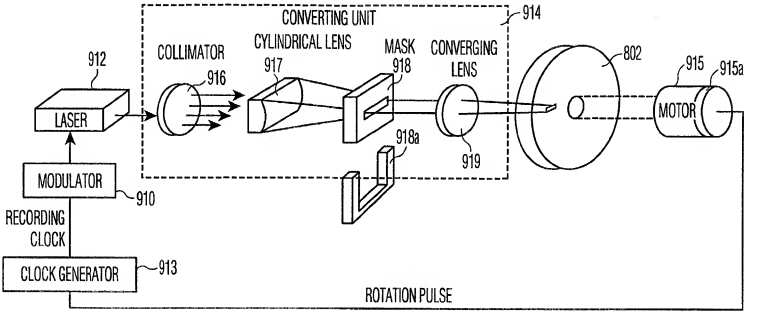


FIG. 28A

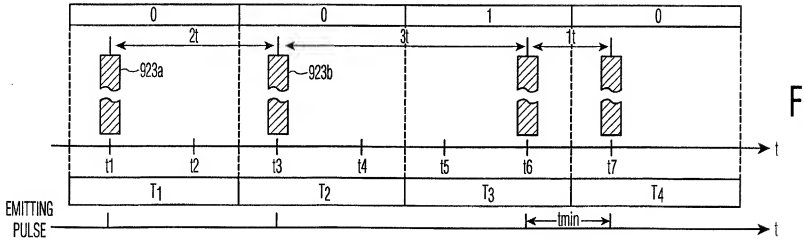


FIG. 28B

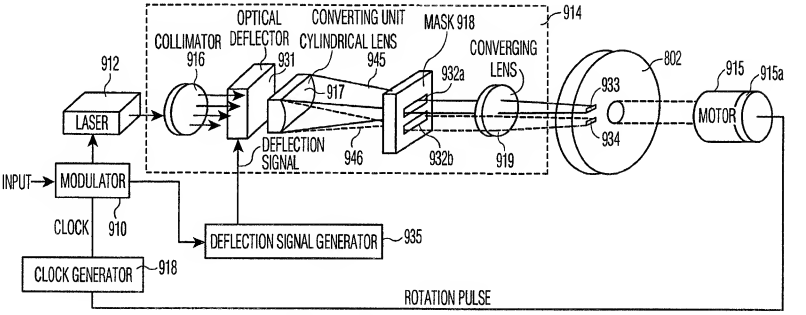


FIG. 29A

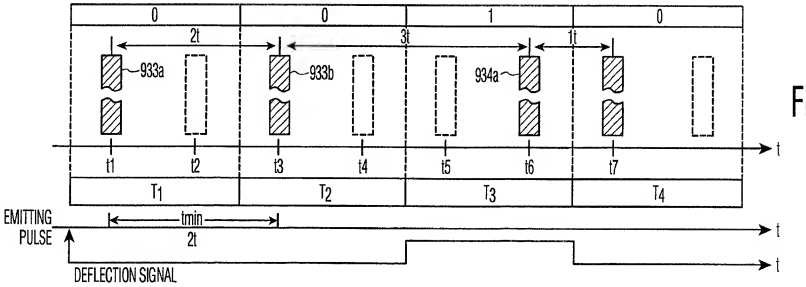


FIG. 29B

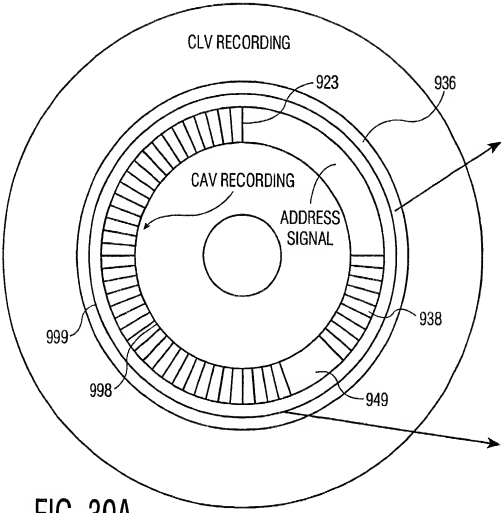


FIG. 30A

FIG. 30B

CONTROL DATA

1	2	3	4
STRIPE PRESENCE/ ABSENCE IDENTIFIER	STRIPE RECORDING CAPACITY	ADDITIONAL STRIPE DATA PRESENCE/ ABSENCE IDENTIFIER	STRIPE REVERSE-SIDE RECORD IDENTIFIER
937		939	948

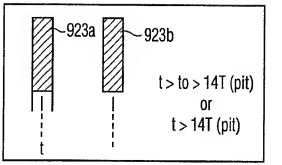


FIG. 30C

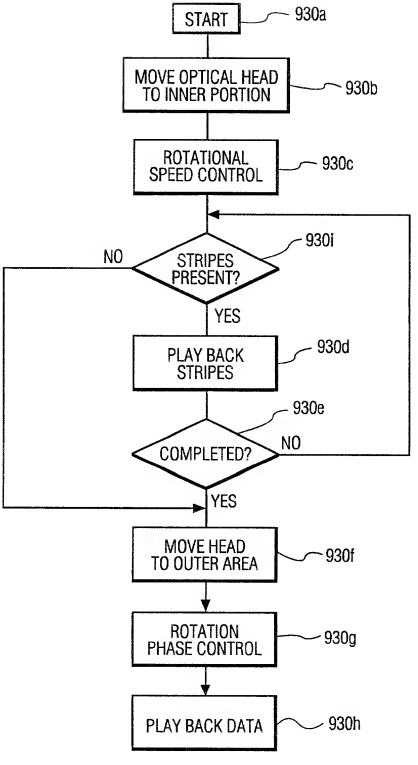


FIG. 31

Entered: 10/05/2007

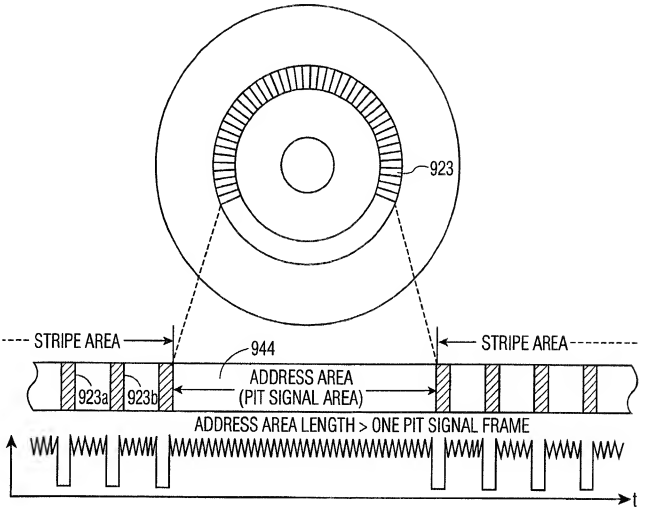

923
STRIPE AREA
944
STRIPE AREA
ADDRESS AREA
(PIT SIGNAL AREA)
923a
923b
ADDRESS AREA LENGTH > ONE PIT SIGNAL FRAME
t

FIG. 32

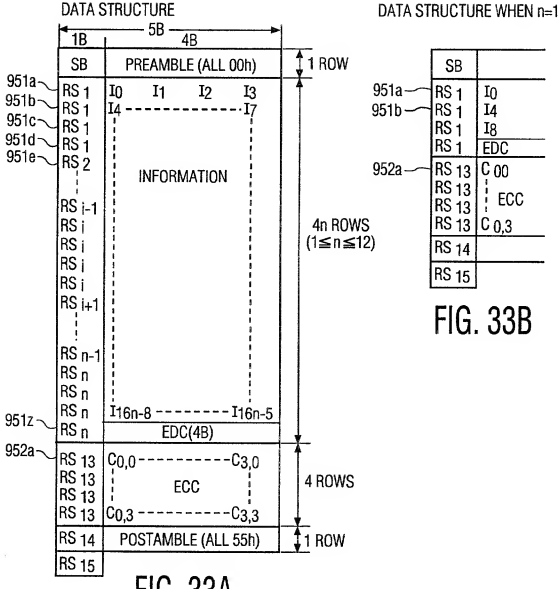


FIG. 33A

FIG. 33B

RANDOM ERROR CORRECTION CAPABILITY

BIT ERROR RATE BEFORE CORRECTION	READ ERROR RATE AFTER CORRECTION
10^{-5}	1 IN 10^{10} DISKS
10^{-4}	1 IN 10^{7} DISKS
10^{-3}	1 IN 10^{4} DISKS
BURST ERROR CORRECTION CAPABILITY	

FIG. 33C

SYNCHRONIZATION CODE DATA

SYNCHRONIZATION CODE

SYNC BYTE /RESYNC	BIT PATTERN											
	FIXED PATTERN (CHANNEL BIT)								SYNC CODE (DATA BIT)			
	C_{15}	C_{14}	C_{13}	C_{12}	C_{11}	C_{10}	C_9	C_8	b_3	b_2	b_1	b_0
SB	0	1	0	0	0	1	1	0	0	0	0	0
RS_1	0	1	0	0	0	1	1	0	0	0	0	1
RS_2	0	1	0	0	0	1	1	0	0	0	1	0
⋮											⋮	
RS_i	0	1	0	0	0	1	1	0			i	
⋮											⋮	
RS_{15}	0	1	0	0	0	1	1	0	1	1	1	1

FIG. 34A

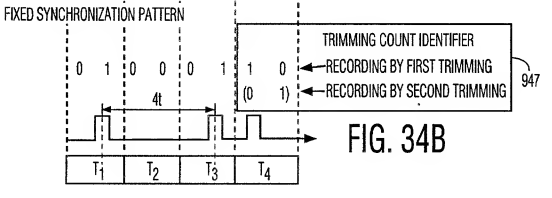


FIG. 34B

MAXIMUM CAPACITY

	RECORDING CAPACITY	TOTAL BYTE COUNT	EFFICIENCY	RECORDING AREA ANGLE	UNRECORDED AREA ANGLE
MINIMUM	12B	41B	29.3%	51 DEGREES	309 DEGREES
MAXIMUM	188B	271B	69.4%	336 DEGREES	24 DEGREES

FIG. 34C

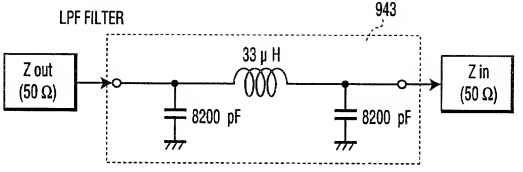


FIG. 35A

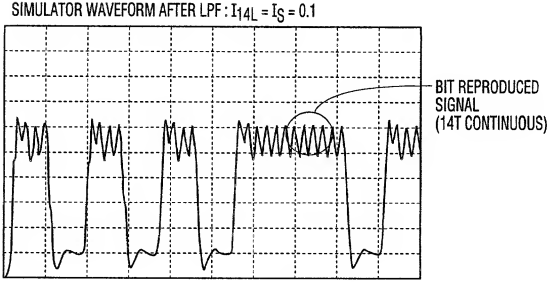


FIG. 35B

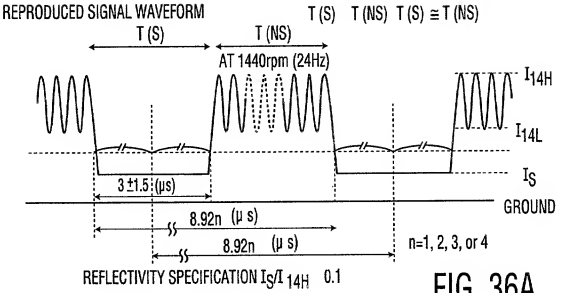


FIG. 36A

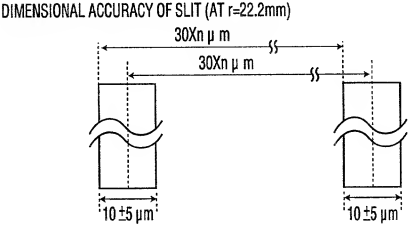


FIG. 36B

FIG. 36C

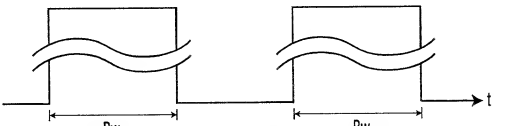


FIG. 36D

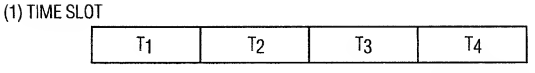


FIG. 37A

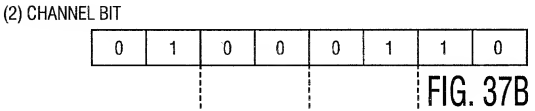


FIG. 37B

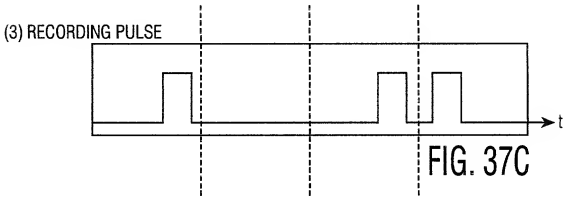


FIG. 37C

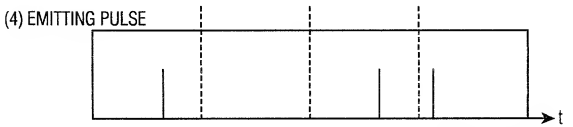


FIG. 37D

20040220 T05500T

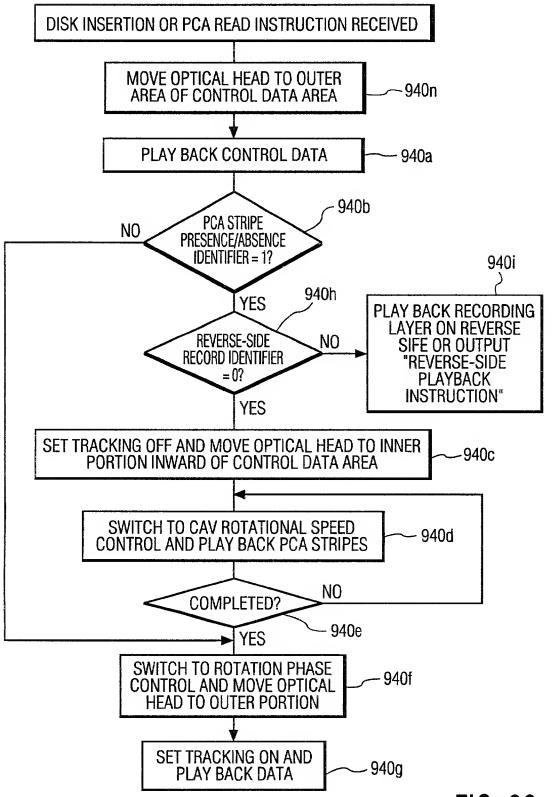

DISK INSERTION OR PCA READ INSTRUCTION RECEIVED
MOVE OPTICAL HEAD TO OUTER AREA OF CONTROL DATA AREA
940n
PLAY BACK CONTROL DATA
940a
PCA STRIPE PRESENCE/ABSENCE IDENTIFIER = 1?
940b
NO
YES
940i
940h
REVERSE-SIDE RECORD IDENTIFIER = 0?
NO
PLAY BACK RECORDING LAYER ON REVERSE SIFE OR OUTPUT "REVERSE-SIDE PLAYBACK INSTRUCTION"
YES
SET TRACKING OFF AND MOVE OPTICAL HEAD TO INNER PORTION INWARD OF CONTROL DATA AREA
940c
SWITCH TO CAV ROTATIONAL SPEED CONTROL AND PLAY BACK PCA STRIPES
940d
COMPLETED?
NO
940e
YES
SWITCH TO ROTATION PHASE CONTROL AND MOVE OPTICAL HEAD TO OUTER PORTION
940f
SET TRACKING ON AND PLAY BACK DATA
940g

FIG. 38

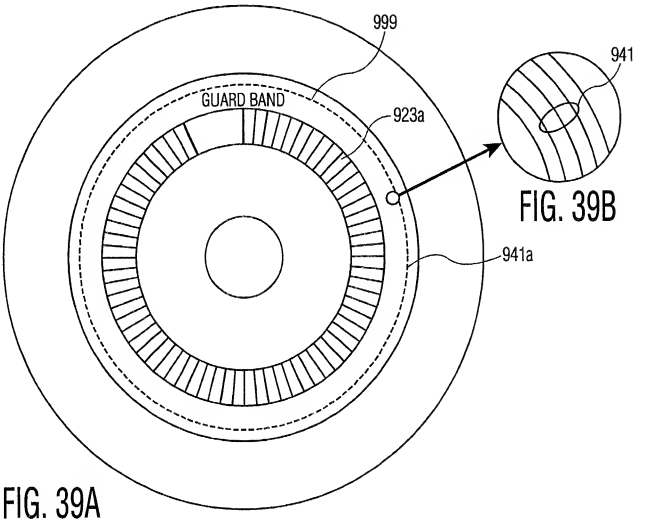


FIG. 39A

FIG. 39B

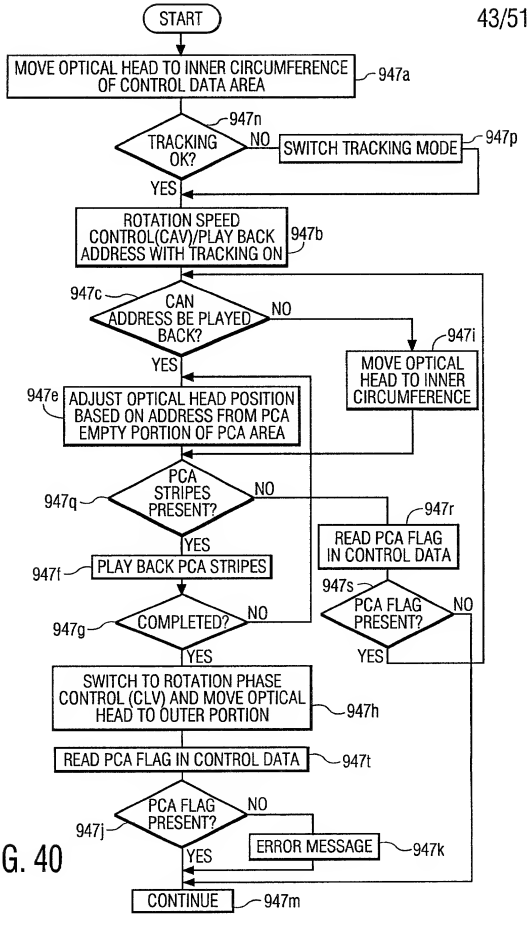

START
MOVE OPTICAL HEAD TO INNER CIRCUMFERENCE OF CONTROL DATA AREA
947a
TRACKING OK?
947n
NO
SWITCH TRACKING MODE
947p
YES
ROTATION SPEED CONTROL(CAV)/PLAY BACK ADDRESS WITH TRACKING ON
947b
CAN ADDRESS BE PLAYED BACK?
947c
NO
YES
MOVE OPTICAL HEAD TO INNER CIRCUMFERENCE
947i
ADJUST OPTICAL HEAD POSITION BASED ON ADDRESS FROM PCA EMPTY PORTION OF PCA AREA
947e
PCA STRIPES PRESENT?
947q
NO
YES
READ PCA FLAG IN CONTROL DATA
947r
PLAY BACK PCA STRIPES
947f
PCA FLAG PRESENT?
947s
NO
YES
COMPLETED?
947g
NO
YES
SWITCH TO ROTATION PHASE CONTROL (CLV) AND MOVE OPTICAL HEAD TO OUTER PORTION
947h
READ PCA FLAG IN CONTROL DATA
947t
PCA FLAG PRESENT?
947j
NO
YES
ERROR MESSAGE
947k
CONTINUE
947m

FIG. 40

US 6,089,901 A 07/18/2000

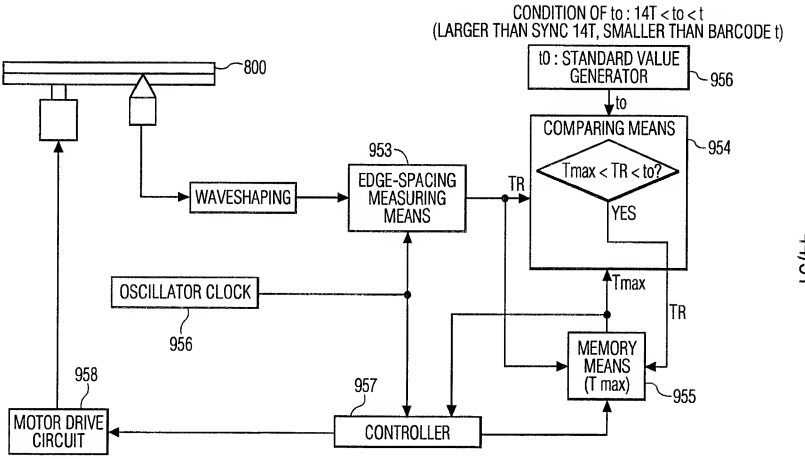


FIG. 41

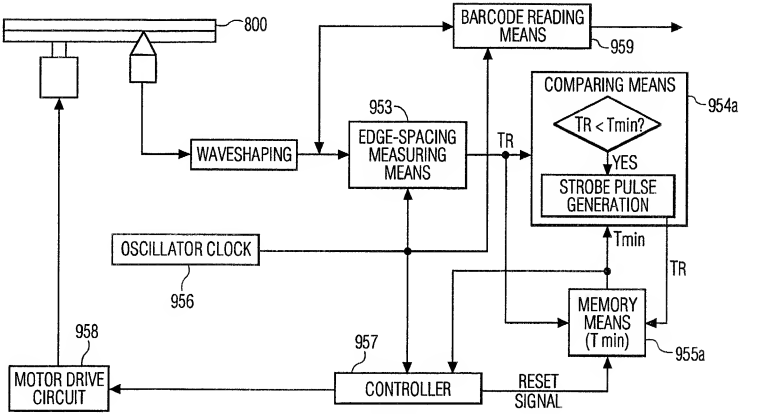

800
BARCODE READING MEANS
959
COMPARING MEANS
954a
TR < Tmin?
YES
STROBE PULSE GENERATION
953
EDGE-SPACING MEASURING MEANS
TR
WAVESHAPING
OSCILLATOR CLOCK
956
Tmin
TR
MEMORY MEANS (T min)
955a
958
957
MOTOR DRIVE CIRCUIT
CONTROLLER
RESET SIGNAL

FIG. 42

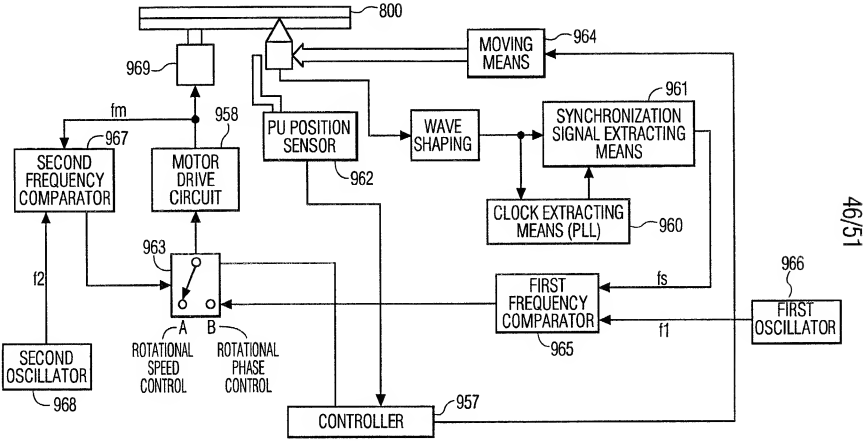

800
969
MOVING MEANS
964
961
fm
958
967
PU POSITION SENSOR
WAVE SHAPING
SYNCHRONIZATION SIGNAL EXTRACTING MEANS
SECOND FREQUENCY COMPARATOR
MOTOR DRIVE CIRCUIT
962
CLOCK EXTRACTING MEANS (PLL)
960
963
966
f2
fs
FIRST FREQUENCY COMPARATOR
FIRST OSCILLATOR
A
B
f1
ROTATIONAL SPEED CONTROL
ROTATIONAL PHASE CONTROL
965
SECOND OSCILLATOR
968
CONTROLLER
957

FIG. 43

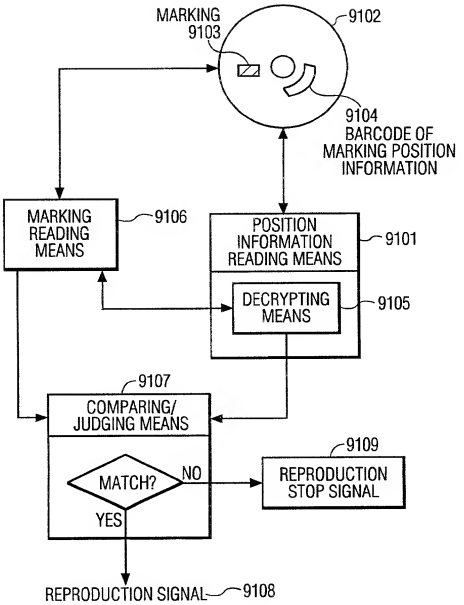

MARKING
9103
9102
9104
BARCODE OF
MARKING POSITION
INFORMATION
MARKING
READING
MEANS
9106
POSITION
INFORMATION
READING MEANS
9101
DECRYPTING
MEANS
9105
9107
COMPARING/
JUDGING MEANS
9109
MATCH?
NO
REPRODUCTION
STOP SIGNAL
YES
REPRODUCTION SIGNAL
9108

FIG. 44

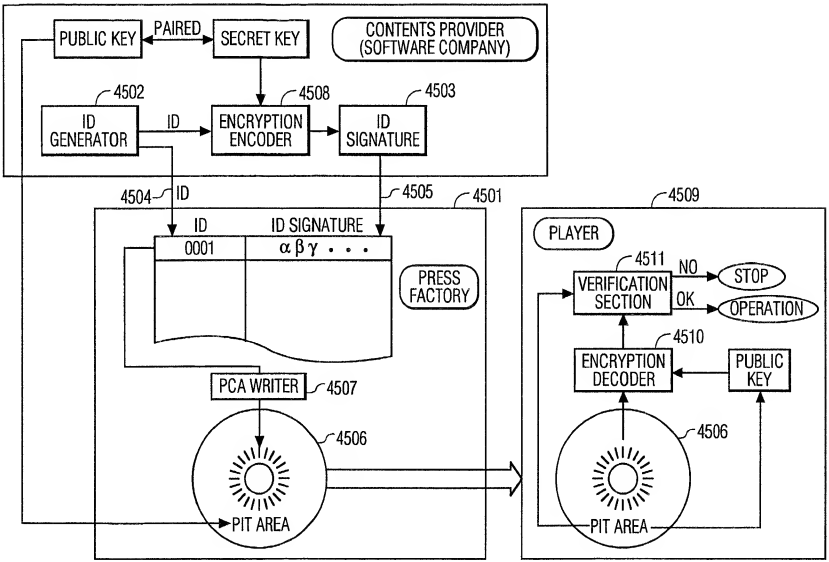

PUBLIC KEY
PAIRED
SECRET KEY
CONTENTS PROVIDER (SOFTWARE COMPANY)
4502
ID GENERATOR
ID
4508
ENCRYPTION ENCODER
4503
ID SIGNATURE
4504
ID
4505
4501
ID
ID SIGNATURE
0001
αβγ . . .
PRESS FACTORY
PCA WRITER
4507
4506
PIT AREA
4509
PLAYER
4511
VERIFICATION SECTION
NO
STOP
OK
OPERATION
4510
ENCRYPTION DECODER
PUBLIC KEY
4506
PIT AREA

FIG. 45

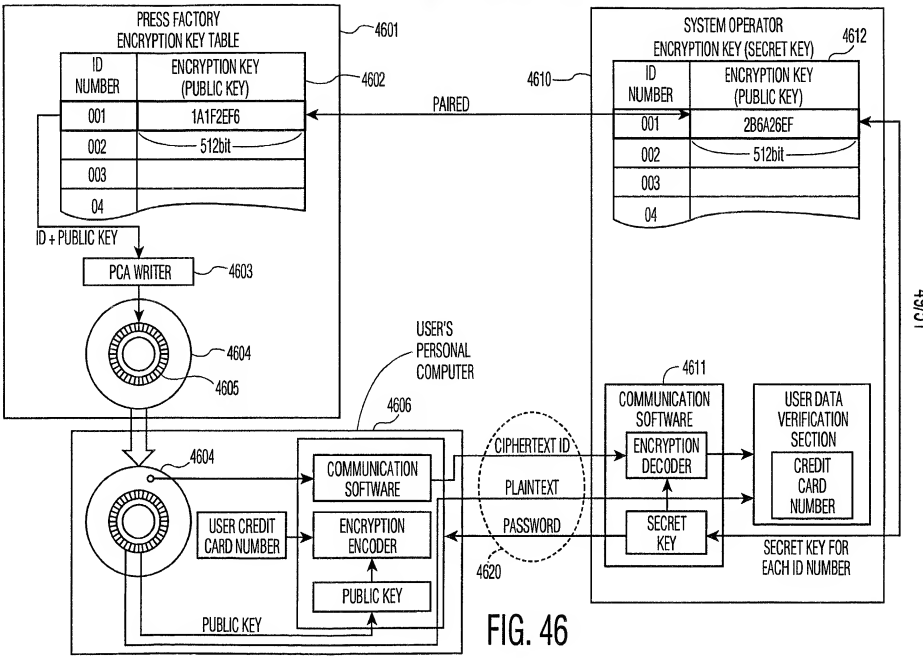

PRESS FACTORY
ENCRYPTION KEY TABLE
4601
ID NUMBER
ENCRYPTION KEY (PUBLIC KEY)
4602
001
1A1F2EF6
002
512bit
003
04
ID + PUBLIC KEY
PCA WRITER
4603
4604
4605
PAIRED
4610
SYSTEM OPERATOR
ENCRYPTION KEY (SECRET KEY)
4612
ID NUMBER
ENCRYPTION KEY (PUBLIC KEY)
001
2B6A26EF
002
512bit
003
04
USER'S PERSONAL COMPUTER
4606
4604
COMMUNICATION SOFTWARE
USER CREDIT CARD NUMBER
ENCRYPTION ENCODER
PUBLIC KEY
PUBLIC KEY
CIPHERTEXT ID
PLAINTEXT
PASSWORD
4620
4611
COMMUNICATION SOFTWARE
ENCRYPTION DECODER
SECRET KEY
USER DATA VERIFICATION SECTION
CREDIT CARD NUMBER
SECRET KEY FOR EACH ID NUMBER

FIG. 46

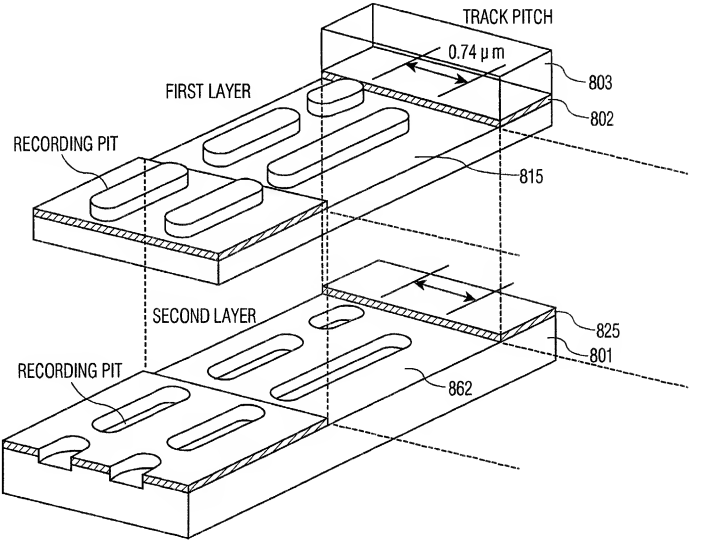

TRACK PITCH
0.74 μm
803
802
FIRST LAYER
RECORDING PIT
815
SECOND LAYER
825
801
RECORDING PIT
862

FIG. 47

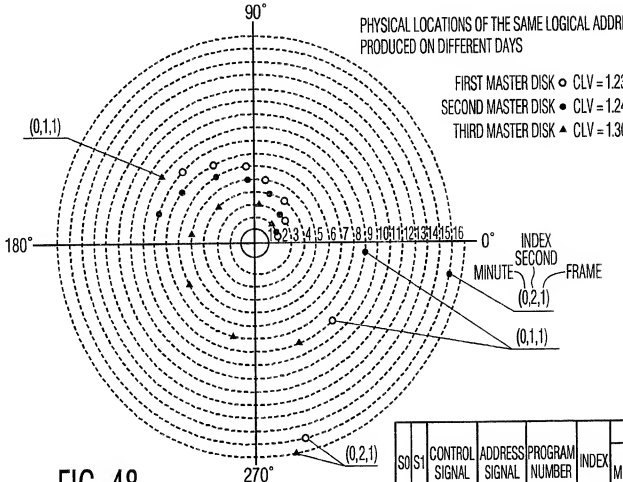


FIG. 48

S0	S1	CONTROL SIGNAL	ADDRESS SIGNAL	PROGRAM NUMBER	INDEX	PROGRAM			0	TOTAL			ERROR CORRECTING CODE CRCC
						MINUTE	SECOND	SCC		MINUTE	SECOND	SCC	